CHEMICAL BIOLOGICAL DEFENSE CONFERENCE

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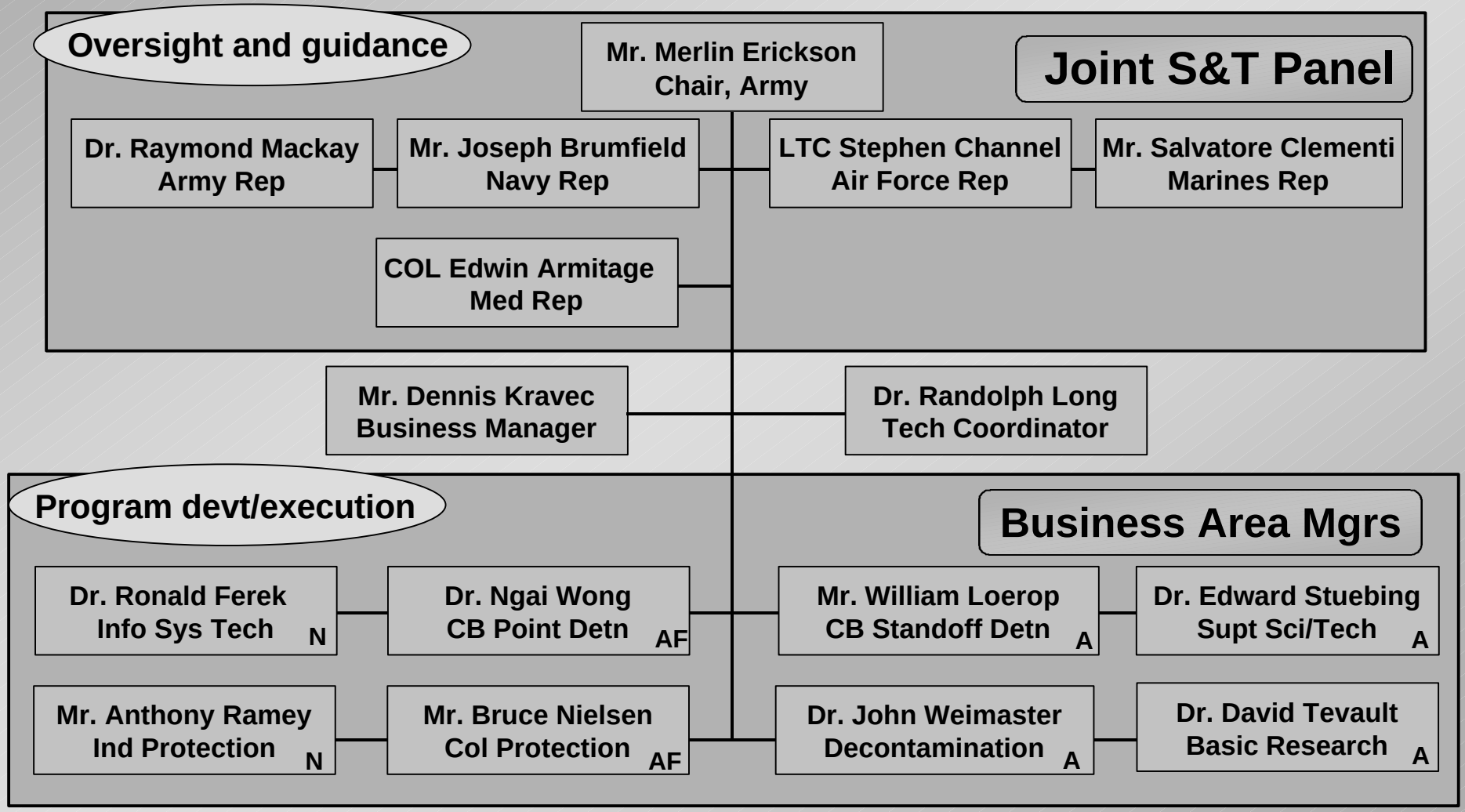
DoD Non-Med Tech Base Process

Joint Science and Technology Panel for Chemical / Biological Defense

- Addresses all phases of research in five commodity areas (modeling/simulation, detection, individual protection, collective protection, decontamination)
- Executed by Principal Investigators within Service labs
- Utilizes proposal-driven process focused by user-developed desired operational capabilities
- Responsive to development/acquisition program
- Managed as fully Joint Services program

Management Structure

Joint Science and Technology Panel for Chemical / Biological Defense



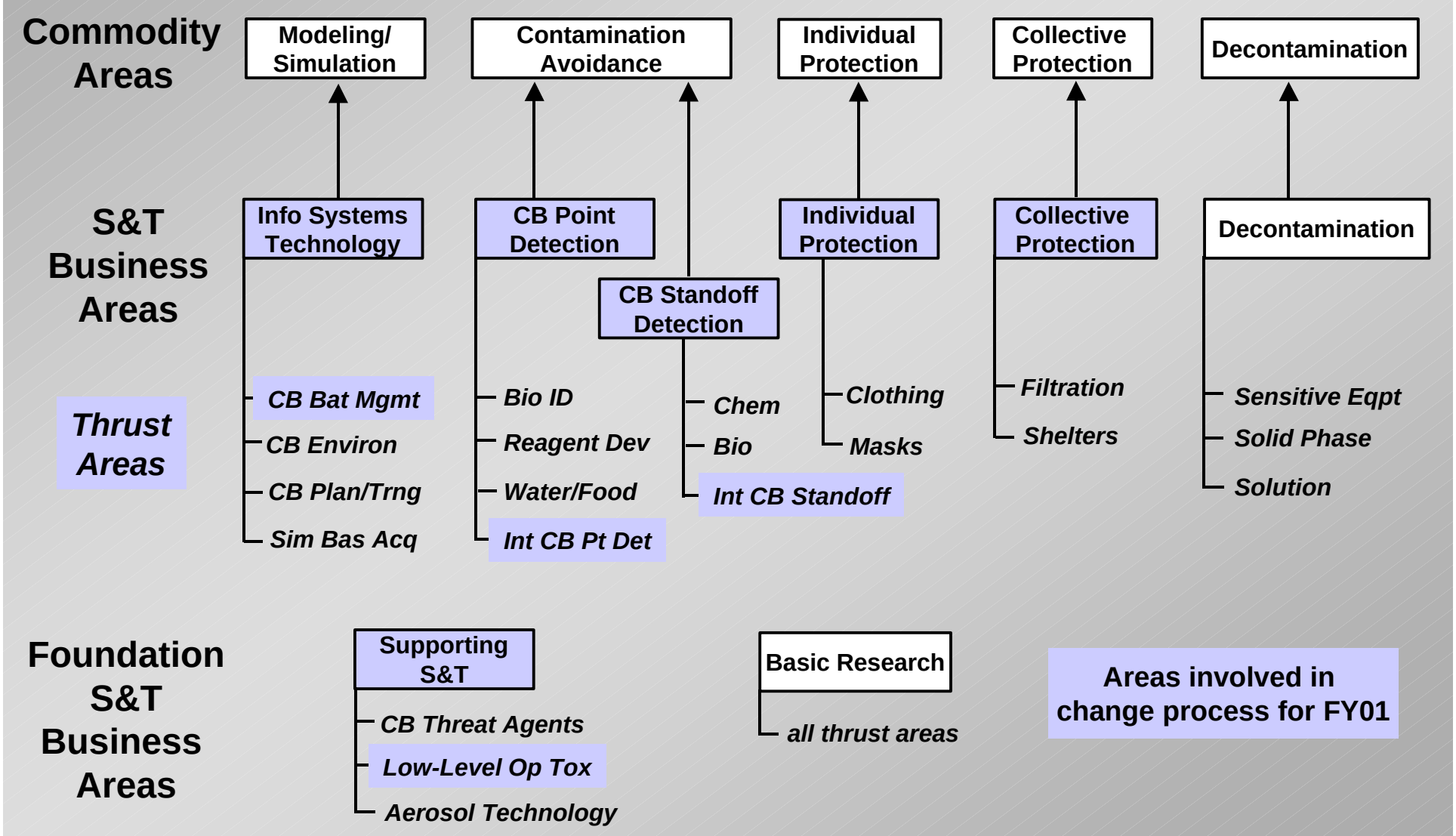
Joint Future Operational Capabilities Ranking: Driver for Investment

Joint Science and Technology Panel for Chemical / Biological Defense

1 BatMgt - Battle Management Systems	11 ConAvoid – Sensor Integration
2 ConAvoid - Biological Early Warning	12 Restore – Medical Diagnosis
3 BatMgt - Battle Analysis	13 ColProt – Mobile Applications
4 ConAvoid – Chemical Early Warning	14 Restore – Medical Treatment
5 BatMgt – Modeling & Simulations Training	15 ConAvoid – Radiological Early Warning
6 IndProt – Medical Prophylaxes	16 Restore – Equipment/Facilities/Large
7 ConAvoid – Biological Point Detection	17 Restore - Logistics
8 IndProt – Respiration & Percutaneous	18 ColProt – Fixed Site Applications
9 ConAvoid – Med Surveillance/ Vet Support	19 ConAvoid – Radiological Point Detection
10 ConAvoid – Chemical Point Detection	20 Restore – Personnel/Patient Decon

Non-Med CB Defense Program Taxonomy

Joint Science and Technology Panel for Chemical / Biological Defense



Near-Term Fielded vs Far Term Desired: An Example of the User's Challenge to S&T

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Joint Bio Point Detn System

- Fully Automated
- 12 Hour Continuous Operations
- 10 Agent ID within Minutes of Detection
- Sample Isolation
- < 30 Minute Set-up

Three years

Joint Chem Agent Detector

- Hand size
- Miosis level detn of blister, nerve, blood
- Records dose
- Networked, remotely controlled

Twelve years

Joint Modular CB Detector

- Hand size (40 cu in)
- Identifies chemical agents
- Detects bio agents
- Networked

Information Systems Technology
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

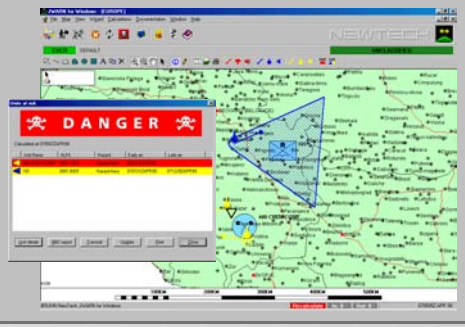
- **New thrust area for FY01-02**
- **Sub-thrusts include**
  - Sensor integration
  - Information management
  - Data fusion
  - Communications interfaces
  - Visualization approaches
- **Panel of experts meeting is planned to refine/develop program objectives**

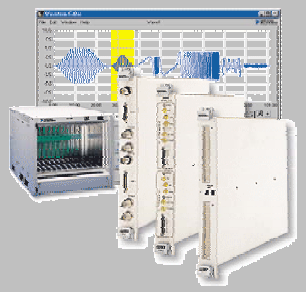
- **Disparate sensors – non-CB sensors that can provide info on CB events**

FY01 activities:

6.2: Survey, characterize available potential sensors, e.g., acoustic, seismic sensors, FLIRs

6.3: Conduct field evaluation of radar as standoff CB event cueing device as well as sensors identified in 6.2; joint with PM-NBC





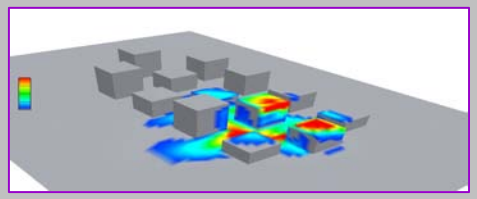
Q36 / Q37

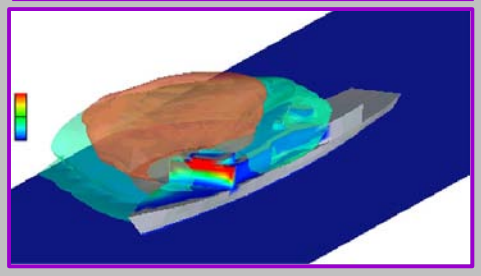
Information Systems Technology
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

CBW Environment

Objective: Models to track evolution of CB threats from vapor, liquid, and solid agents across range of scales from individual to theater





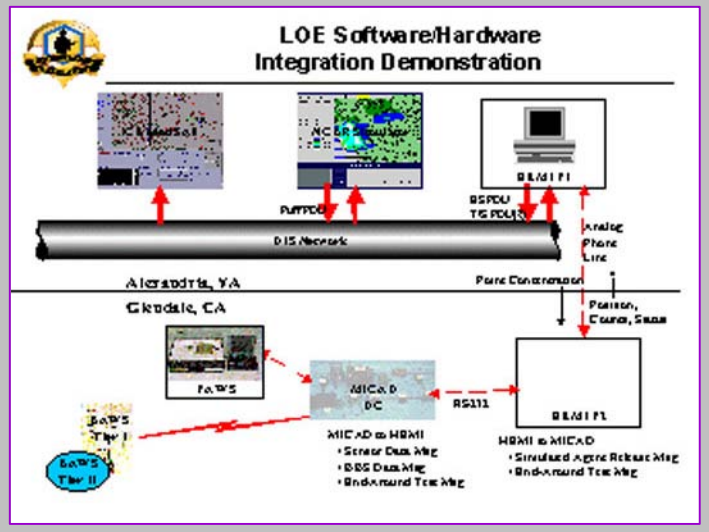
CBW-CFX Model

CB Planning/Analysis

Objectives: Models to describe effects of CBW on operations

Simulation Based Acquisition

Objective: Models supporting development of CBD equipment



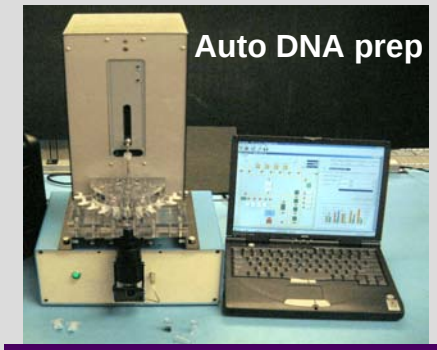
CB Point Detection
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Biological Identification

Objectives: Develop fully automated sample prep and analysis systems for unattended monitoring of air samples; transition FY02 to JBPDS

Challenges:
- **fluidics**
- **biomarker extraction/cleanup**
- **background interference**

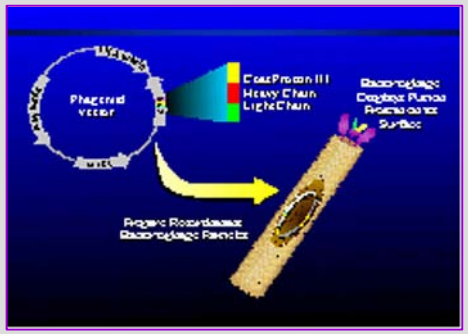


❖ Demonstrated detection of mass and genetic markers at JPBDS requirement levels; built 2 cu ft breadboards

Reagent Development

Objectives: Develop improved reagent candidates for implementation in fielded and developmental identifiers via Critical Reagent Program

Challenges:
- **specificity**
- **shelf life**
- **reproducibility**



❖ Demonstrated improved sensitivity of recombinant antibodies vs available monoclonals; initiated assessment of combinatorial peptide

CB Point Detection
Thrust Areas

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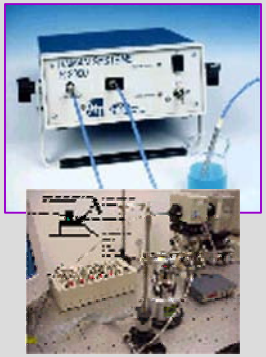
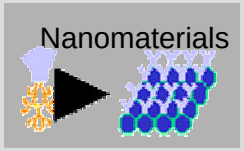
Detection in Water/Food

Objectives: Provide the capability to detect, identify, and quantify chemical and biological contamination in potable water

Challenges:
- **Non-traditional threat environment**
- **Immature technologies**
- **Sampling low level toxics**



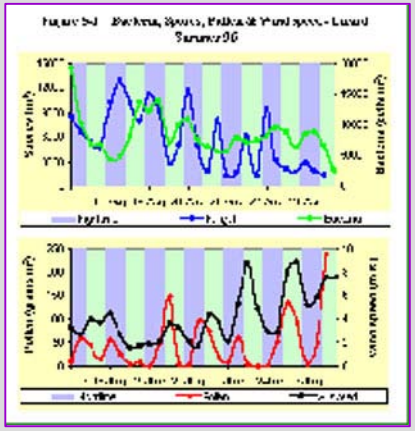


❖ ***Model technology downselect process utilized fair assessment of technology candidates from all sources***

Supporting Studies

Objectives: Assemble database of available ambient background data and analyze for key heuristics

Challenges:
- **multiple sources of data**
- **disparities in collection parameters**



❖ ***Established joint DoD/DOE/TTCP website; data loading and analysis in process***

CB Point Detection
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Integrated Chem Bio Point Detectors

Objectives: Develop small, hand-size detectors to identify chemical agents and detect/discriminate biological agents

Challenges:

- Miniaturization of detector technologies
- Small, efficient air samplers
- Simultaneous optimization of size, selectivity, and sensitivity

Pyrolysis-GC/IMS

Optical fluorescence

❖ *Py-GC/IMS demonstrated high detection probability and sensitivity relative to other candidates at JFT-6*

❖ *Air samplers evolving to smaller size with increased efficiency*

CB Standoff Detection

Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Chemical Standoff Detection

Objectives: Develop and demonstrate passive and active concepts for remote detection, identification, ranging, and mapping of chemical clouds in all physical forms

Challenges:

- **High speed interferometry; focal plane arrays**
- **Rapid data processing, software**
- **Laser technology to reduce size, weight of active systems**

Chemical Imaging Sensor

JS Warning ID Lidar

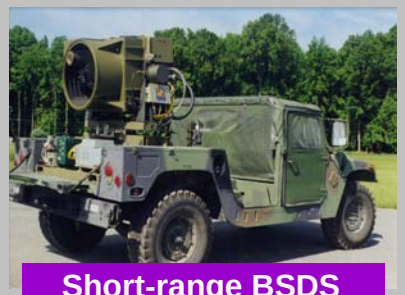
❖ ***Demonstrated 100 scan/sec operation in field with 9-pixel array passive CIS spectrometer***

Bio Standoff Detection

Objectives: Develop and demonstrate concepts for remote detection, identification, ranging, and mapping of biological particulate clouds

Challenges:

- **Laser technology to reduce size, weight of active systems**
- **Rapid data processing, software**
- **Spectroscopic technologies to enhance potential for classification**



Short-range BSDS

❖ ***Initiated panel of experts to develop and down-select concepts for exploration under Bio Standoff DTO***

CB Standoff Detection

Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

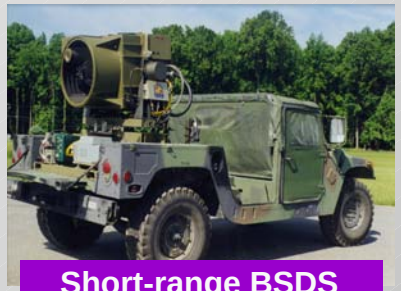
Integrated
CB Standoff Detection

Objectives: Develop and demonstrate concepts for remote detection, identification, ranging, and mapping of chemical and biological clouds in all physical forms with a single sensor platform

Challenges:

- **Laser technology to reduce size, weight of active systems**
- **Significant advances in spectroscopy**
- **Rapid data processing, software**

JS Warning ID Lidar



Short-range BSDS

Merge capabilities into a single small platform

?

Individual Protection
Thrust Areas

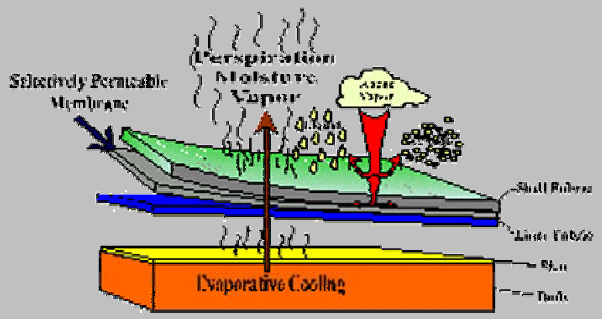
Joint Science and Technology Panel for Chemical / Biological Defense

Clothing

Objectives: Develop overgarments against CB agents that provide increased protection with decreased impediment of wearer's performance

Challenges:

- **Selectively permeable materials**
- **Interface of SPMs with garment fabric**
- **Testing**



❖ Developed and demonstrated two SPM garments that outperform all fielded garments and are 50% lighter

Masks

Objectives: Demonstrate concepts that enhance respiratory and head protection against CB agents

Challenges:

- **Adsorbent materials**
- **End-of-service life indication**
- **TICs/TIMs**

❖ Met or exceeded all JSGPM filter goals

Collective Protection
Thrust Areas

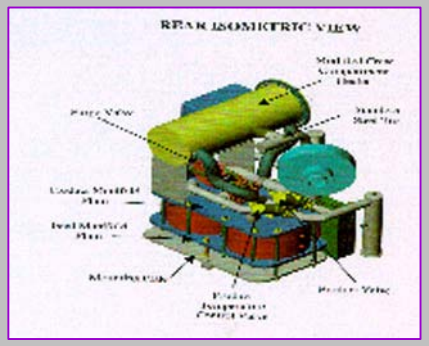
Joint Science and Technology Panel for Chemical / Biological Defense

Filtration

Objectives: Develop filtration approaches that reduce frequency of filter changes and are applicable to all toxic materials

Challenges:

- **residual life indicators**
- **filter regeneration**
- **biological filtration**



❖ Completed evaluation of filter adsorbents against TICs

Shelters

Objectives: Develop collective protection shelters with improved environmental isolation against threats from CB and toxic materials

Challenges:

- **Hermetic seals**
- **Rapid deployment**

❖ Transiitoned low cost tentage effort to JTCOPS

Decontamination
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Sensitive Equipment

Objectives: Decontaminate sensitive equipment, interiors of combat vehicles and aircraft, and interiors on the move.

Challenges:
- **Identify freon alternatives**
- **Material compatibility**
- **Man-portable, on-the-move decon**
- **Agent destruction following removal**

❖ Conducted technology assessment and identified leading candidates for JSSED program. Identified hydrofluoroether as freon alternative.

Solid Phase

Objectives: Investigate and validate cost effective deactivation and destruction of CW agents rapidly by solid matrices. Extend technology to areas beyond sorbent decon.

Challenges:
- **Mass transfer constraints**
- **Enhance chemical reactivity**

❖ Measured kinetics of VX, GD, and HD on nanosize calcium oxide and aluminum oxide. Autocatalytic for HD elimination process.

Decontamination
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Solution Chemistry

Objectives: Develop decon systems that supplement or replace existing systems used for immediate, operational and thorough decon and to replace DS2 and aqueous bleach in thorough decon applications.

Challenges:
- **Optimize chemistry - co-solvents**
- **Stabilize the system**
- **Peroxide logistic issue**

❖ ***Candidate formulations have been identified that react rapidly and effectively for HD, GD, and VX.***

Enzyme Reactants

Objectives: Develop and demonstrate a new generation of CB warfare agent decontaminants that are non-toxic, non-corrosive, non-flammable, environ. safe and lightweight.

Sub-thrust to solution chemistry

Challenges:
- **Identify appropriate enzymes**
- **Genetic engineering needed for large scale production**
- **Maintenance of catalytic activity**

❖ ***Increased activity on enzymes with activity for V-agents by 10-fold over baseline. Identified materials technology approach to destroy H-agents.***

Supporting Science and Technology
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

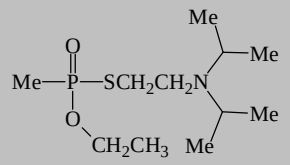
Threat Agents

Objectives: Maintain awareness of evolving threat agent materials and conduct R&D studies to validate and characterize, and to assess fate of CB materials in environment

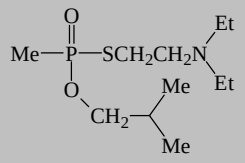
Challenges:

- **ever expanding array of threats**
- **infrastructure issues**
- **identification of adequate simulants**

VX (US)



R-33 (Russian)



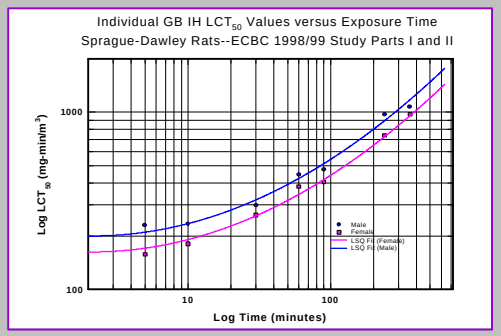
❖ Conducted multiagency workshop on bioaerosol threat

Low-Level Operational Toxicology

Objectives: Develop sound values for exposure levels having physiological impact below acute response levels to guide development of detectors and protective equipment

Challenges:

- **Identifying physiological indicators of low level exposure**
- **Developing exposure methodologies**
- **Extrapolating to human response**



❖ Extend CT range for acute effects

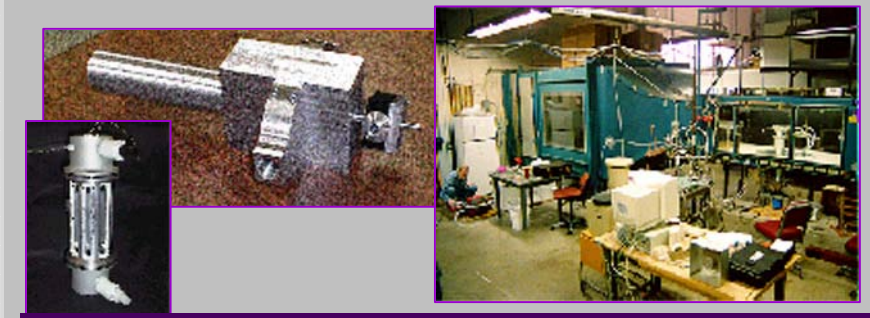
Supporting Science and Technology
Thrust Areas

Joint Science and Technology Panel for Chemical / Biological Defense

Aerosol Technologies

Objectives: Characterize and test developmental air samplers/collectors; evolve new concepts toward next-generation small air samplers

Challenges:
- **high velocity test challenges**
- **size, power required to sample large volumes**



❖ ***Developed isokinetic, isoaxial reference reference sampler; developed new microslit transpirated impactor***